

Space Weather Forecast

Issued on Monday, 08 January 2024 at 00:55 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Minor Radio Blackouts (R1) becoming Likely. Now reduced and falling slight chance of Minor Geomagnetic and Minor Solar Radiation Storms (G1 and S1).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low, with frequent low to mid-ranking Common-class X-ray flares, peaking with an event at 07/2225UTC from a departing sunspot on the southwestern solar horizon. There were up to nine sunspot regions on the facing side.

A sunspot region near the middle of the Sun was one of the more noteworthy magnetically, with an east-west orientated magnetic neutral line and a period of emergence of minor spots and pores forming first a ring-shaped structure and then a sigmoid shape, which can sometimes precede activity. Another region of note was in the southeast, which although complex became marginally more open-centred by the period's end. Perhaps the strongest growth trend was seen in a group on the south central disc, which saw a period of strong spot development and later a spreading and areally increasing trend.

The UTC weekend saw several minor coronal dimmings from the closely-knit central and northwestern disc clusters of sunspot regions. None have been definitively linked to Earth-directed CMEs, but this assertion is lower confidence than is typical given their small stature and frequency.

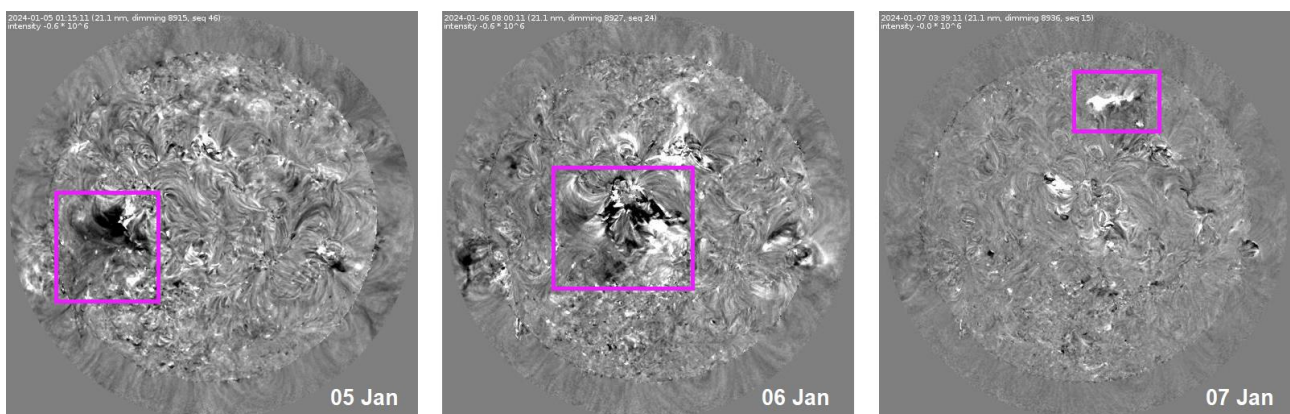


Figure 1: Main recent CME candidates. The left and central CMEs have slight Earth-bound components, due to pass the radius of Earth's orbit later in the current UTC day and around the turn of the UTC day 09 into 10 January respectively. The third CME is a modelled close miss passing during the UTC day of 10 January.

A 'filament eruption' (arc of plasma leaving the Sun) was observed leaving the northwest around 07/0320UTC on extreme UV imagery, with a centroid very approximately near N30W010. This has
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been associated with faint ejecta seen heading mainly north and slightly west of the Sun-Earth line. MOSWOC modelling suggests that this CME misses Earth on 10 January. A second event associated with activity near the middle of the Sun and a filament occurred around 07/1215UTC, with possible ejecta released. This could not be linked with any subsequent events on imagery, and although still under assessment, it is now considered to have perhaps not left the immediate solar environment and been reabsorbed. Similar activity was observed in a filament trailing a sunspot region in the northwest through the UTC afternoon, and although buffeted by minor flares, no interplanetary CMEs could be definitively linked to disturbances here.

Solar Wind / Geomagnetic Activity: Solar winds showed a slow regime. The solar wind speed showed a level tendency at background levels, with unremarkable numbers of particles in the solar wind passing Earth, with a modest associated magnetic field. The net result of the above solar wind measures was provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, and protons measured in the near-Earth environment continued their slow decline of recent days towards resting background levels in falling from around 2pfu to below 1 (where Minor Solar Radiation Storm 'S1' is 10pfu).

Four-Day Space Weather Forecast Summary

Solar Activity: The risk of Moderate-class flares rises slightly to become Likely in the period, with a continuing slight chance of Strong-class.

Solar Wind / Geomagnetic Activity: Up to two CMEs feature at present and one fast wind regime. The most likely course of events is for the overdue fast wind to arrive within the first 24 hours, possibly now with the northeast quadrant CME from 05 January. The second east-central CME from 06 January may then follow after another 24 hours - with decreased likelihood and impact.

The net result is a falling Slight Chance of G1 through the first half of the UTC working week - most reliably Quiet at the end of the four-day period (barring new CMEs).

Energetic Particles / Solar Radiation: In the absence of further proton-rich flares in prone locations, levels may be allowed to relax back to resting background before the middle of the coming UTC working week, with a daily slight chance relaxing back to a residual risk by midweek after last week's enhancements.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	20	10	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	50	55	60	55
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	15	15	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)